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Vaughan, of the University of Michigan, has recently investigated the poisoning of a number of persons by ice-cream at Newton, Mich., and is reported to have found tyrotoxicon present in the ice-cream which produced the sickness. This had been previously discovered by Professor Vaughan in pieces of cheese which had caused sickness, and which had been submitted to him for examination. Whether this poison is due to a germ, or to a chemical product, does not yet seem established; but it is but another proof of the possibilities of milk, either infected or decomposed, acting as a factor in disease, and it is not improbable that diarrhoeal diseases so common among the infantile population in the summer months may be caused, or at least aggravated, by milk which contains the tyrotoxicon.

THE BILL authorizing the President to appoint a commission to investigate yellow-fever and the methods proposed for its prevention has passed the senate, and, as there is now no opposition to its passage in the house, there is every probability of its becoming a law. In the mean while, Dr. Freire, who claims to have discovered the microbe of the disease and a method of inoculation to prevent its ravages, is reported to have performed the operation upon seven thousand persons living in localities where yellow-fever is prevailing in a most malignant form. Of this large number, but eight have died. During the same period, some three thousand uninoculated persons have succumbed to the fever. Should the bill to which reference has been made obtain a place in the statutes, these claims of Freire will be subjected to rigid investigation by the best American experts, and, if substantiated, will doubtless be the means of introducing his system, or a modification of it, into the United States, whenever yellow-fever shall again appear in epidemic form.

IT HAS ALWAYS been difficult to understand how the germ theory of disease could be true, and yet the diseases which are due to germs could vary so much in virulence; at times being exceedingly mild, and again malignant in the highest degree. Dr. Sternberg, in a recent paper published in the *Medical news*, makes this very clear, thus removing what has to many seemed an insuperable objection to the acceptance of the germ theory. Germs which produce disease, that is, pathogenic germs, are subject to great modifica-

tion as regards this power. Germs which to all appearances are the same, and which, so far as we know, are in fact identical in most particulars, may yet differ in their virulence; being extremely so under some circumstances, and but slightly so under others. It is for this reason that virus may be 'attenuated,' as it is termed. Thus the microbes which produce fowl-cholera in a fatal form may, after two or three months, lose this virulence, and still possess some pathogenic power. It is this principle of attenuation which enables experimenters to inoculate animals with the same microbe, but of gradually increasing virulence, until perfect protection, even against the most virulent form of the disease, is assured. A mild attack of scarlet-fever is explained, therefore, not on the ground that only a few microbes of the disease exist in the body of the individual attacked, for we know that this form of life multiplies with enormous rapidity, but by the probable fact that the microbes in this individual case possess a mild degree of virulence.

The further and deeper research is made into this domain of bacterial life, the more apparent does it become that disease-producing germs are wide-spread and abundant; and, if animals susceptible to any particular variety come in contact with that variety, it is easy to understand how disease may be contracted, even when no other animal has been brought in contact with them. For instance: the bacillus which causes fowl-cholera is found in various parts of the world in putrid substances, and as a result epidemics of fowl-cholera are most frequent among fowl that are kept in unsanitary conditions. In the same way typhoid-fever and cholera may develop irrespective of human intercourse or *fomites*. Much of this may seem trite, but the tendency of the present day is to ignore filth as a factor in the production of germ-diseases, and to limit their causation to the presence of other similarly affected persons or animals, and to the articles which have been in contact with them. In helping to clear up the question, Dr. Sternberg has done good service.

THE ECONOMIC DISCUSSION IN SCIENCE.

It is often doubted whether any good comes of polemical discussion in a periodical; and so obvious are the disadvantages under which those labor who would maintain a scientific position in

popular debate, that many refuse to attempt it under any circumstances. Points are brought up which require lengthy elucidation, and that must be compressed into a single sentence which ought to be elaborated in an entire article. Then it is necessary to assume certain primary considerations ; for, should it be endeavored to begin at the beginning and prove satisfactorily to the writers themselves every step taken, it would end in the construction of a complete scientific treatise which might fill several volumes. I believe the representatives of the new school of economics who undertook to prepare a series of articles for *Science* on a number of economic topics were fully aware of the difficulties of their task, and it is certain that the invitation of the editor of this journal was accepted with hesitation. Nevertheless, I must be allowed to express satisfaction with the general course of the discussion so far, and I am convinced that the readers of *Science* have obtained new and valuable ideas from the able articles both of Dr. Seligman and of Professor James. However familiar the views so well set forth in these articles may be to Professor Newcomb, there is no evidence of an acquaintance with them on the part of what might be called the educated American public, and it is unquestionable that they differ in radical particulars from the economic doctrines current in our magazine and newspaper literature. As a matter of course, these articles have been scarcely more than suggestive. It was not intended that they should be exhaustive, for that was impossible within the limits of the assigned space.

Professor Newcomb's article illustrates vividly the difficulties of a discussion of economic theories in a periodical. He sweeps over an immense field, touching on the development of economic doctrines, on the functions of the state, enlarging a little more on the relations of economics to ethics, and concluding with an irrelevant allusion to the condition of American shipping.

I should desire a volume — and a large one — to expose all the errors which, in my opinion, are implied in the article of the distinguished mathematician of the Johns Hopkins university. I will nevertheless endeavor to set a few of the points involved before the readers of *Science* in such a manner as to enable them to understand better the nature of the controversy, and to help them to follow out the argument in their own thoughts.

First, I must begin with a personal explanation. There seems to be an implication, though doubtless inadvertent, in the article of my learned colleague, that I am a socialist. True, I believe that the state has its industrial sphere, and that a larger one than many have been inclined to think ; but I hold quite as strenuously that the individual has

a sphere of economic action which is an equally important one. I condemn alike that individualism which would allow the state no room for industrial activity, and that socialism which would absorb in the state the functions of the individual. Doubtless I have written more or less about socialism, and I have attempted to tell the truth about socialists, for I have not believed that the generally accepted lies about them could be of any avail to society. The university of which I have the honor to be a member has adopted for its motto the grand sentence, '*Veritas vos liberabit*.' This I accept and have found a source of inspiration. I may go even further. I believe that the socialists have added to our stock of economic knowledge, and that we have a great deal to learn from them. On the other hand, it is safe to say, that, among those who are known as the new school of political economists, there is not a single one who could be called an adherent of socialism, pure and simple. It is, I believe further, safe to assert that pure socialism is advocated by no teacher of political economy in any American college or university. Professor Newcomb finds the present economic discussion — as yet incomplete, be it remembered — disappointing, and because more has not been said about the state, since "the main point in which the new school is supposed to differ from the other is that it looks with more favor upon government intervention in the processes of industry and trade." Of all the articles in this series, only one deals exclusively with the state ; and yet the topics were selected by the writers of these articles. Is not this in itself a sufficient refutation of this popular supposition ? What those who consented to write these articles desired was to place before the readers of *Science* an outline of their fundamental doctrines. They wished to present their opinions as they in reality are, not as people might suppose them to be. In my article I ventured the opinion that the radical difference between the old and the new school consisted, *not* in the views held of the state, but in the establishment of a new relation between ethics and economics. Others, possibly the majority, find the main difference in method, about which Professor Smith of Columbia is to contribute an article. It is necessary in all discussion to grasp the fundamental fact that what one believes, and what one is said to believe, are two quite different things.

Professor Newcomb claims that nothing new has been said in regard to the state, because every one is willing to admit that state intervention is right if it is useful. I am glad that it is admitted that state intervention is considered as merely a question of utility. It is a great deal to have gained that point, and to be able to quote Professor Newcomb in favor

of the position. This is very different from the ordinary view, which is that the state has no right to participate in economic and industrial life. Some time ago Dr. Lyman Abbott wrote an article for the *Century magazine* in which he raised the question, whether the United States would not have done better to build and manage itself the Pacific railways rather than to give vast empires of land, and millions in money, to corporations to induce them to construct those great highways. His argument was presented with a great deal of force ; but, in a later issue of the magazine, space was given for an objection. In what did the objection consist ? Simply the dogmatic assumption that it was not the province of government to construct and manage railways. It was not regarded by the writer as essential to prove that it would not have been useful. When the question was raised recently in Philadelphia, whether the public gas-works should be sold to a private corporation, many newspapers thought it an argument to urge that it was not the function of a municipality to furnish gas. These are typical cases ; and it is, I repeat, a satisfaction to be able to cite Professor Newcomb as an authority against such dogmatism.

Again : the article by Dr. James is criticised because 'there is so little to object to in it.' This is another concession which must give satisfaction to many members of the new school. It differs widely from prevailing public opinion ; and even so liberal and progressive a man as Professor Taussig thinks that Professor James 'goes too far.' A new theory of taxation is suggested by Dr. James, which is, I think, of far-reaching importance. It is not at present received either by our legislative or our judicial bodies.

Professor Newcomb's position as first stated, in regard to the development of economic thought, differs not in one whit from that of the new school. Adherents of this school all regard economics as a development, and, without exception, they value the works of their predecessors. They were the first in America to give a proper position to Adam Smith, Ricardo, and Malthus, by the introduction of courses in the history of political economy into our colleges. In the 'Statement of principles' of the American economic association, it is expressly declared that 'we appreciate the work of former economists.' Again : it is pleasant to be able to agree with Professor Newcomb ; but, as a matter of fact, this is a different opinion from that which was a short time ago current. Writers, not long since, looked upon political economy as a complete and perfect science, true for all times and all places. Buckle and Lord Sherbrooke advocated this view ; and even Professor Laughlin of Harvard, who probably does not regard himself at all

as a representative of the extreme 'orthodox' school, conveys the impression, in his useful little work on methods of instruction in economics, that there is, after all, not much constructive work to be done in our science. When Professor Newcomb, however, begins to criticise Dr. Seligman, I am unable to agree with him ; for he speaks as if political economy were a mathematical science, with a body of truth unchangeable and eternal, like the statement, "A straight line is the shortest distance between two points." It is, according to this view, only the application of fixed principles which must be changed with time and place. Now, what is this body of mathematical truth in economics ? There are some truisms in economics of that nature ; but a large and important body of such principles I have never been able to discover, though I have searched for it long and diligently. It seems to me that Professor Newcomb fails to distinguish between mathematical sciences and those which are more descriptive in their nature, and have to do with growing, changing bodies.

This brings us naturally to Professor Newcomb's objection to my conception of economics as a science concerned with what ought to be, — an objection which it seems to me, though very natural in a mathematician, is not valid. I believe all sciences which treat of concrete organisms consider what ought to be as well as what is. The scientific physician treats of the perfect body as well as of the diseased, imperfect body. The biologist observes living forms, and expresses approval and disapproval. Natural sciences treat continually of purpose and adaptation to ends. Who can so well treat of social remedies as he who has studied society ? Why stop when we have reached that point which first renders our science useful ?

Professor Newcomb implies the argument, formerly a favorite one and still too common, that selfishness and enlightened philanthropy lead to the same ends. Observation does not confirm this. To a certain extent their courses will be parallel ; but in important particulars there will be a divergence, and that divergence will be the difference between health and disease. His illustration of the treatment of the servant 'Cuffee' is pertinent. A careful observer will note a very different treatment of him by a selfish lady, and one who applies the dictates of ethics to her everyday life. This difference will affect the welfare of 'Cuffee' materially. I dismiss the question "Would he (Professor Ely) have Cuffee trained into a novelist, a chemist, or a metaphysician ?" as not pertinent to the discussion, and as being, in fact, the exact opposite of what I did say. Not to weary the readers of *Science*, and not to make

too large demands on the available space of this journal, I will conclude with one further general consideration.

Professor Newcomb closes his article with the statement of an objection against state intervention, based on the observation that our congressmen, and I suppose our rulers in general, are not a very wise body of men, and presumably do not know better than others what is for our good. This shows, it seems to me, a total misapprehension of the question involved. Nobody wants to intrust certain things to the government because the government is very wise and very good. Nobody desires paternal government. Even the extreme socialist does not desire it. What he wishes, and believes practicable, is a fraternal commonwealth. The question involved is not, "Shall we let wiser and better people than we attend to our affairs for us?" but "Shall certain functions be performed by co-operative methods, or by individual methods?" for the state is only a certain kind of co-operative institution. Then, if we decide on co-operative methods, shall we adopt voluntary co-operation, possibly that of a corporation, or shall we adopt the compulsory co-operation of the state?

Now, inquiry shows that certain functions are adapted for individual effort, that certain others will be best performed by voluntary co-operation, while still others can be accomplished most advantageously by the compulsory co-operation of the state or of some subdivision thereof. What these are, space does not permit me to say in this place.

I have, however, laid down a few simple rules elsewhere;¹ Prof. Henry C. Adams has gone into the subject far more at length in his paper, "Principles that should control the interference of the states in industries;"² while valuable suggestions may be found in the admirable monograph of Dr. James, on the "Relation of the modern municipality to the gas-supply," just published by the American economic association. It is enough, if in this series of articles the general points of view of the new school can be impressed upon the readers of *Science*. It may be remarked, however, that 'interference' is not so good a word as 'participation' to denote the activity of the state; for it is not opposed to, but, if wise, in the line of the desires of the people, and precisely on that account it is not generally noticed how large is its sphere.

Finally, the case is not nearly so hopeless as one

¹ In my 'Introduction to the labor problem,' published by Harper and Brothers, 1886.

² A lecture printed in pamphlet form by the Constitution club of New York.

would gather from Professor Newcomb's observations. Experience, sooner or later, teaches the people many wise things. It is the function of the economist to help the people by more careful observation, and thus to shorten the term of unfortunate experimentation, and to lessen the cost of that dear teacher 'experience.' Take the case of the post-office. Experience and science have decided that its functions should be performed by public authorities, trial having been made of private enterprise. That question is settled, and the benefits of correct practice are inestimable. Take the case of letter-carriers in cities. They are a great saving and convenience. I suppose, in a city like Baltimore, the time they save to citizens must amount to hundreds of years in each year. The benefits derived from letter-carriers are equal to those of great inventions, but they have been demonstrated, and are secure. I think the railway problem, now prominent, will be settled in the same way; that is, by experience, aided largely by science.

It is not necessary that the majority, or even a great many, — that is, compared with the entire population, — should have special and profound knowledge in economics in order to secure intelligent economic action. The influence of two or three men 'who know' is enormous when exerted at the right time and in the right place. I suppose six men in congress who thoroughly understood public finance could, at the beginning of our late civil war, have shaped the financial policy of government for years to come.

I wish again to call attention to the forcible illustration to which allusion has already been made. A few months since, the question was raised whether the gas-works of Philadelphia should be sold. Few understood the question; and it is said that a systematic agitation in favor of private works was conducted by a vast corporation, which had its eyes fastened on them as a mine of wealth. But there was one man in Philadelphia who did understand the question in all its bearings, and that was Dr. James. He came forward and set the matter in its true light, and I have been told that his influence was decisive. At any rate, it had weight, and the gas-works remain to-day the property of the municipality. That decision was worth many millions of dollars to the city of Philadelphia, and is an illustration of the value of the higher education. All that the University of Pennsylvania ever cost the citizens of Philadelphia, either in their private or public capacity, is a small matter compared to the value to that municipality of a single man who occupies a chair in that institution of learning.

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